

Performance Measure Profile

NAS Energy Efficiency

FY 2013 Methodology Report



Federal Aviation
Administration

Performance Measure Applicability

☒ **DOT Strategic Plan**

Goal: Environmental Sustainability

Outcome: Reduction in transportation-related carbon emissions, improved energy efficiency, and reduction in use of oil in the transportation sector.

Metric: Improve National Airspace System (NAS) energy efficiency (fuel burned per distance flown) by at least 2 percent per year from 4.24 teragrams per billions of kilometers (Tg/Bkm) in 2010 to 3.75 Tg/Bkm in 2016.

☐ **Agency Priority Goal**

☒ **Destination 2025**

Goal: Sustain Our Future

Outcome: Accelerate NextGen technology and operational improvements to reduce fuel burn.

Metric: Improve NAS energy efficiency (fuel burned per miles flown) by at least 2 percent annually.

FY 2013 Performance Target

Improve aviation fuel efficiency by at least 2 percent per year, through FY2025, as measured by the calendar year 2012 fuel burned per miles flown, relative to the calendar year 2000 baseline.

Lead Organization: Policy, International Affairs & Environment (APL)

	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013
Target	-9%	-10%	-12%	-14%	-16%
Actual	-14.03%	-15.25%	-14.50%	-14.76%	-15.61%

Definition of Metric

Metric Unit:	Cumulative reduction in fuel burned per mile flown.
Computation:	Measuring and tracking fuel efficiency from commercial aircraft operations allows FAA to monitor improvements in aircraft/engine technology and operational procedures, as well as enhancements in the airspace transportation system. The FAA measures performance against this target using the Aviation Environmental Design Tool (AEDT). AEDT is a FAA-developed computer model that estimates aircraft fuel burn and emissions for variable year emissions inventories and for operational, policy, and technology-related scenarios. For this target, AEDT is used to generate annual fuel burn and total distance flown data for all U.S. commercial operations.
Formula:	$\frac{\text{Fuel Burn (Tg)}}{\text{Distance (billions of kilometers)}}$ (Fuel Burn values in Teragrams, Tg, where 1 Tg = 10 ¹² grams)
Scope of Metric:	This measure focuses on all U.S. commercial operations.
Method of Setting Target:	The fuel efficiency target was selected based upon knowledge of the factors that most accurately characterize commercial aircraft fleet fuel efficiency. The data that underlies this target can be assessed in terms of aircraft and engine technology, fleet turnover, and air traffic management procedures that influence routes and schedule.

Why the FAA and/or DOT Choose this Metric

Measuring and tracking fuel efficiency from aircraft operations allows FAA to monitor improvements in aircraft/engine technology and operational procedures, and enhancements in the airspace transportation system. This information provides an assessment of their influence on reducing aviation's emissions contribution.

Public Benefit

Today's aircraft are up to 70% more efficient than early commercial jet aircraft. However there is growing concern over aviation's impact on the environment and public health. Aviation is currently viewed as a relatively small contributor to those emissions that have the potential to influence air quality and global climate. Carbon dioxide (CO₂) emissions are a primary greenhouse gas and are directly related to the fuel burned during the aircraft's operation. As air traffic grows, this contribution will increase without improvements in technology, more efficient air traffic operations, and renewable fuels.

This measure supports the development of these improvements to reduce aviation's impact on the environment and thereby improve public health and welfare. In addition, more fuel efficient aircraft should contribute to improving the financial well-being of commercial airlines and a growing economy.

Partners

The National Aeronautics and Space Administration (NASA) works with the FAA to conduct research and development in order to identify engine and airframe technologies that offer potential for reducing fuel burn and emissions. The Aerospace Industries Association works with the FAA and NASA to commercialize technologies from the research phase and develop operational procedures to address environmental impacts. Airlines for America works with the FAA to identify fleet and air traffic procedural changes that improve fuel efficiency.

External Factors Affecting Performance

NAS Energy Efficiency is heavily dependent on commercial airline operating procedures and day-to-day operational conditions. This includes the airline's operating fleet and route assignments, air traffic conditions, weather, airport operating status, congestion in the system, and any disruptions that introduce delay in scheduled flights. For example, a major sustained disruption or enhancement in air traffic and/or a significant shift in commercial operations amongst airlines, including changes in fleet composition and missions could have a profound impact upon achieving the performance target.

Source of the Data

The AEDT uses radar-based data from the Enhanced Traffic Management System (ETMS) and Official Airline Guide (OAG) schedule information to generate annual inventories of fuel burn and total distance flown data for all U.S. commercial operations.

Statistical Issues

Potential seasonal variability and variability from year-to-year can be expected when analyzing air traffic data and commercial operations.

The extent to which enhancements are incorporated to improve model accuracy, for example via more robust aerodynamic performance modeling algorithms and database of aircraft/engine fuel burn information, will impact the overall results and thus the performance target. This could create some statistical variability from year-to-year if not properly taken into account. In cases where such enhancements have the potential to create a significant shift in baseline, annual inventories may need to be re-processed and/or adjusted to ensure consistency and accuracy of results.

The extent to which aircraft fleet improvements cannot be sufficiently modeled because of a lack of manufacturer proprietary data may also influence the performance target results. In this case, attempts will be made to characterize such aircraft with the best publicly available information, recognizing that newer aircraft types in the fleet will likely exist in significantly lesser numbers, thus minimizing the influence upon the results.

Completeness

Data used to measure performance against the target is assessed for quality control purposes. Input data for the AEDT model are validated before proceeding with model runs. Radar data from the ETMS are assessed to remove any anomalies, check for completeness, and pre-processed for input to the AEDT model.

ETMS data are verified against the OAG information in order to avoid any duplication of flights in the annual inventory.

In some cases ETMS data lack appropriate fields to conduct quality control and in these cases the data is removed. Data from the AEDT model is verified by comparing output from previous years and analyzing trends to ensure that they are consistent with expectations. In other cases monthly inventories may be analyzed to validate the results. Model output is subsequently post-processed through excel worksheets to perform the calculations for the performance target. Formulae and calculations are checked in order to ensure accuracy.

Full documentation of this target is determined when the annual inventories have been accomplished and the post-processing calculations have been completed, resulting in a percentage reduction in fuel consumption per miles flown (or increase in fuel efficiency) relative to the baseline. The standard for this documentation is set by the FAA Office of Environment and Energy, which is separate from the organization (DOT Volpe National Transportation Systems Center) responsible for input and output associated with the AEDT model runs and annual inventories.

Reliability

The measuring procedure used for this performance target is highly reliable. That is to say that the processing of data through the AEDT model including the performance of algorithms is not subject to random factors that could influence the results. However, as mentioned above, this performance target is potentially influenced by factors outside the control of the FAA.

We do not expect increases in fuel burn or decreases in distance traveled or both to degrade the fleet fuel efficiency significantly. However, we do expect that in the near future, aircraft and engine technology improvements or air traffic management improvements or both may not be enough to offset traffic growth, congestion and delays. In addition, the current metric for measuring and tracking fuel efficiency may not adequately capture performance to the degree that would allow future decisions on technological and operational considerations. Thus, we are continuing to review the impact of improvements on air traffic management and changes in operational trends to assess whether we should use a revised performance metric for future targets.